

REMARKS

The rejection of Claims 1-9 under 35 U.S.C. §103(a) as being unpatentable over US 4,192,936 or US 4,152,350, each to Möhring et al in view of US 3,903,127 or US 3,976,622, each to Wagner et al, and US 3,367,956 to Hennig et al, is respectfully traversed.¹

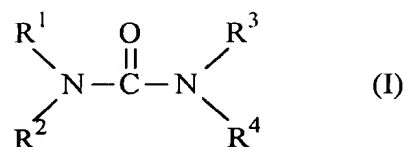
The invention relates to a process for the preparation of a polyisocyanate which contains one or more biuret groups by reacting

a) an aliphatic or cycloaliphatic isocyanate containing two or more isocyanate groups (isocyanate a) with

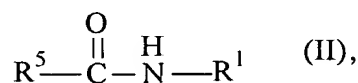
b) a tertiary alcohol or a mixture of water and a tertiary alcohol (biuretizing agent b)

at from 100 to 250°C, which comprises carrying out the reaction in the presence

c) of a stabilizer (c) consisting essentially of a catalytic amount of urea, ammonia, biuret, a urea derivative of the formula I

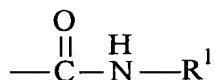


in which R¹, R², R³ and R⁴ are hydrogen, C₁ to C₁₀ alkyl or C₆ to C₁₀ aryl, or a carboxamide of the formula II



¹The disclosures of each of the Möhring et al patents, and the Wagner et al patents, respectively, are identical. Thus, we refer herein to US 4,152,350 of Möhring et al and US 3,976,622 of Wagner et al.

in which R⁵ is C₁ to C₁₂ alkyl which is unsubstituted or in which 1, 2 or 3 hydrogen atoms are replaced by a radical



As discussed in the specification, the biuret-containing polyisocyanate prepared by the known processes from tertiary alcohols and isocyanates leave much to be desired, since they are too dark in color for many applications and, in particular after prolonged storage, still include considerable quantities of readily volatile monomeric isocyanates.

Applicants have discovered an economic process by whose use it is possible to prepare biuret-containing polyisocyanates which are pale in color and whose contents of volatile isocyanates, particularly after prolonged storage, is low.

An essential feature of the claimed invention is the presence of a stabilizer (c) consisting essentially of a catalytic amount of a compound as defined. It is due to the presence of such component (c) as a catalyst, not as a biuretizing agent, in place of other known catalysts, such as those disclosed by Wagner et al at column 6, lines 30 to 42, that, unexpectedly, an improved product is obtained, as so factually demonstrated by the comparative evidence in the case. Note the results set forth for the products according to the Examples of the invention in Table 1 at page 9 of the specification compared to the results of the Comparative Examples in Table 2 at page 10 of the specification.

As is evident from the results set forth in these Tables, it is apparent that the products obtained by the claimed process evince significantly lower color numbers as well as their monomer content being significantly and materially lower.

Möhring et al discloses a process for the formation of allophanate containing biurets (column 3, line 41) comprising reacting an isocyanate with a biuretizing agent consisting of mixtures of a primary, secondary, or tertiary alcohol; a particular mono- or poly-amine having at least one aliphatically, cycloaliphatically or araliphatically bound primary amino group; and optionally water (column 3, lines 63-66). The use of a primary alcohol is preferred (column 3, lines 57-62 and column 5, lines 59-62). The process of Möhring et al thus clearly is significantly and materially different from the claimed invention.

Wagner et al discloses various biuretizing agents, including the presently-recited tertiary alcohol biuretizing agent and various substituted ureas, inclusive of the presently-recited catalytic stabilizer. Hennig et al discloses various substituted ureas, inclusive of the presently-recited catalytic stabilizer, as a biuretizing agent.

In rejecting the claims over the cited references, it is the Examiner's position that it would have been obvious to use the biuretizing agents of Wagner et al and Hennig et al in place of the amine component of Möhring et al, in that they allegedly function in an equivalent manner.

It is submitted that this is not a viable position for a number of reasons.

First of all, the recited stabilizer of the present claims is not an "amine containing" stabilizer. There are no amines in the stabilizer Markush group. There is no disclosure or suggestion in any of the cited prior art that the, for example, urea-containing biuretizing agents of Wagner et al or Hennig et al are, or would be expected to be, equivalent to the particular mono- or poly-amine compound of Möhring et al. Note that urea is not an amine.

The biuretizing agent in Möhring et al is a mixture of amines, alcohols, and optionally water (column 3, lines 63-66), not the amine alone. It is not clear why one of ordinary skill in the art would replace the biuretizing agent of Möhring et al, let alone only the amine therein,

with another biuretizing agent, unless polyisocyanates of the type which Möhring et al produce, i.e., a mixture of biuret polyisocyanates and allophanate polyisocyanates, are disclosed as being formed with said another biuretizing agent. There is no disclosure or suggestion in Wagner et al or Hennig et al that such polyisocyanates are the results of their processes.

Indeed, the reaction products of the claimed process are practically allophanate-free biurets even though a tertiary alcohol is used as a reagent therein. The reason for this is that during the reaction in a first step a urethane is formed which in a second step is decomposed into an amine, CO₂ and an olefin. In a third step this amine forms urea with additional isocyanate and finally this urea forms biuret with additional isocyanate. Note, page 2, lines 1 to 5 of the specification. Since during the process the amine is formed in situ, no amine has to be introduced initially.

Component (c) in the claimed process is present as a catalyst in a catalytic amount, not as a biuretizing agent as so disclosed by Wagner et al and Hennig et al. Component (c) in the claimed process is used in place of a catalyst as disclosed by Wagner et al, resulting in unexpected improvements.

The Examiner's response to the above argument is that it is obvious to combine known biuretizing agents, and that it is immaterial what names, i.e., biuretizing agents, stabilizers, or catalysts, are used to describe the components. The Examiner further concludes that the catalytic amount of Applicants' stabilizer is comparable to the amounts of Möhring et al's nitrogen-containing agents.

Applicants respectfully submit that the name used is material. By reciting that stabilizer (c) is present in a catalytic amount, it is understood that this material influences the rate of reaction but does not itself enter into the reaction, as a biuretizing agent will. The

present recital "catalytic amount" is clearly a claim limitation herein. Furthermore, even if the Examiner were correct that it would have been obvious to combine known biuretizing agents, this would at best present only a *prima facie* case of obviousness. The prior art neither discloses nor suggests that the addition of the relatively smaller amounts of the presently-recited stabilizer, such as urea or a substituted urea, materially affects both the color of the final biuret-containing polyisocyanate and the residual monomer content. Compare Comparative Example 6 or 12, which contain no stabilizer, with the comparable stabilizer-containing examples of the present invention, in Tables 2 and 1, respectively.

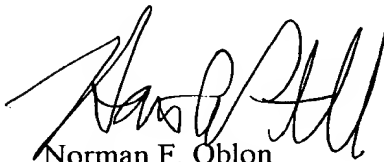
Further, the comparative evidence in the case, which compares the catalysts of Wagner et al (see Table 2) is a direct comparison with Wagner et al, clearly the closest prior art. This evidence could not have been predicted by persons skilled in the art.

Accordingly, withdrawal of the rejection of the claims under 35 U.S.C. §103 is requested.

It is submitted that the claims define a patentable invention. Their allowance is respectfully solicited.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read 'Norman F. Oblon', written in a cursive style.

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